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कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

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1. Despite a vast coastline and a number of waterways, why has India not been able to achieve its potential in bringing a significant modal shift from rail and road to waterways?

India is naturally endowed with a vast coastline of 7516.6 km as well as 7 major rivers. This provides ample scope for a robust ~~and~~ water transportation.

However, India has not yet achieved its potential in water transports. The **REASONS** include -

- a) Geographical →
- Uneven distribution (North is land-locked and rivers are not equally distributed)
  - Seasonal nature of many rivers  
- Flow is very less in dry seasons
  - Indian rivers have high volumes of silt, this makes transportation difficult.
  - High dredging can damage river beds and aquifers.

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## b) Infrastructural -

- very slow development of port infra.
- Inadequate linkages with the hinterlands

## c) Other Issues -

- Do not offer door-to-door connectivity
- Lesser transport speed
- Various hurdles in river-interlinking projects
- Inadequate Funding.

Consequently, railways and roads are preferred for transport due to ADVANTAGES like

- a) dense networks
- b) Faster transport
- c) door-to-door connectivity

~~d)~~ At the same time, to develop waterways, government has taken many steps. This includes -

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## Initiatives

### Jal Marg Vikas Project

- For capacity augmentation of National waterways

### Sagarmala Project

- To develop coastal shipping & reduce logistics cost

Major Port Authority Bill - to revamp ports.

This will not only ~~reduce~~ boost logistics, but also help India to leverage its Blue Economy capacity.

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2. The move to establish a National Bank for Financing Infra and Development (NBFID), to reverse the drag on India's growth potential will have its own set of challenges. Discuss.

Following the covid-19 Pandemic and an economic slowdown, capital availability has taken a hit as GDP growth stagnates and NPAs rise.

Thus, NBFID is set up as a Development Finance Institution to support development of long-term non-recourse infrastructure spending.

Benefits

provides long-term finance where banks can not.

Tax benefits & concessions related to it will have positive impact on bond market

provides technical and managerial expertise to projects.

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However, HABFID will have its own set of **CHALLENGES**.  
This includes -

## Challenges

Taking credit decisions to avoid NPA's (underwriting weak loans, corruption, etc)

More number of DFIs, counties  
- productive competition & poor resource allocation

Need for trust between private and public sector

Need to compete with private sector to attract & retain talent despite average remuneration

Developing a comprehensive strategy to attain socio-economic objectives.

These challenges need to be addressed through standardized regulations, performance analysis, etc.

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3. Highlighting the issues related to the current fertilizer subsidy regime in India, discuss the need for reforms in this context.

Being an agriculture-based economy, India is the 3<sup>rd</sup> largest consumer of fertilizers globally. At the same time, the Union government bears fertilizer subsidy for the farmers.

The fertilizer-subsidy regime in India has various **ISSUES** such as -

- India depends highly on import for fertilizers. This results in higher costs.

- While the ideal HPK ratio is 4:2:1, it is used in 8.2:3.2:1 in India due to -

- Lack of awareness among farmers
- Cheaper urea.

This causes soil degradation & groundwater pollution

- Issues of payment-delays to urea companies.

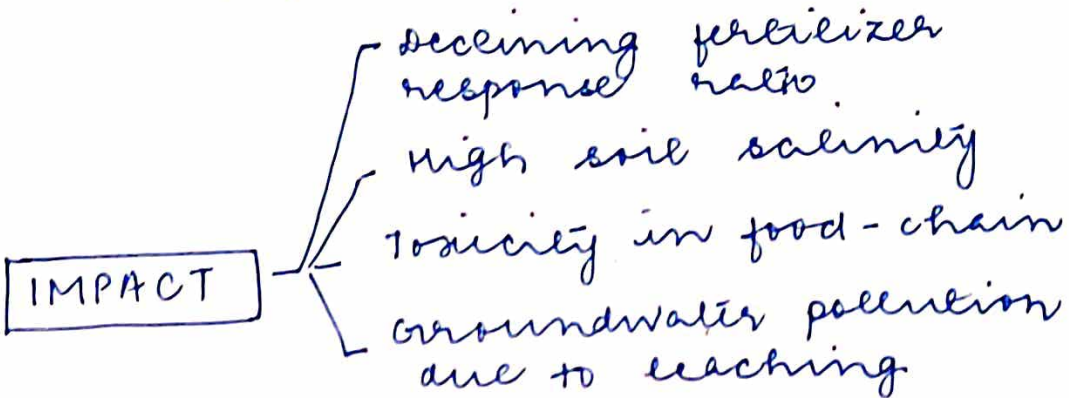
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- Illegal diversion of urea for non-agricultural purposes.
- No-denial policy → Anybody (even non-farmers) can purchase any quantity of subsidized fertilizer using point of sale machines.



Thus, various **REFORMS** are needed, such as -

1) Sharda Pawar Committee recommended inclusion of urea under Nutrient-Based Subsidy (NBS).

2) Mekani Task Force - paying all fertilizer subsidy directly to farmers via DBT.

3) Reasonable cap on total number of subsidised fertilizer bags any one can buy during a cropping season.

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4) Popularizing Soil Health Card scheme for balanced fertilizer usage.

5) Increasing Micro-nutrients (Zinc, Boron, Iron, etc.) based organic fertilizers.

This will rationalize the fertilizer - subsidy bill as well as make farming more sustainable.

4. Identifying the need for a climate resilient agriculture in India, discuss how it can be achieved.

With rising temperatures, extreme weather conditions, etc., climate change is becoming a harsh reality.

In this context, climate resilient Agriculture is the need of the hour. This is because -

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## ◦ Declining Water Resources -

- climate change is making monsoon erratic while ~52% agriculture in India is rainfed.
- With higher temperature, water table is depleting faster.

## ◦ Harsh Weather -

- Sudden rains, floods and hail storms are destroying crops
- Droughts are becoming frequent

## ◦ Lower Productivity - As per studies, a 1°C increase can reduce yields of wheat, soyabean, mustard, groundnut, potato, etc. by 3-7%.

- More heat also causes animal distress, affects livestock.

Thus, Since around 50% of Indians are still engaged in farming and farm insurance cover remains low, agriculture needs to be climate resilient. This can be ACHIEVED through -

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## 1) Technology Usage -

- More accurate weather prediction  
E.g. NADAMS
- More information dissemination  
Eg. m-Kisan App

## 2) Improving irrigation efficiency

- Promoting Micro-irrigation
- Cones-crop method  
→

## 3) Tolerant crops

- Millets are photo-insensitive and can survive on rough terrain and less water
- Need to rebrand coarser grains as 'nutri-cereals'.

## 4) Tolerant livestock by focus on indigenous breeds.

## 5) Reducing GHG emission from agriculture by -

- Zero Budget Natural Farming
- Zero tillage farming

## 6) Reduce post-harvest losses -

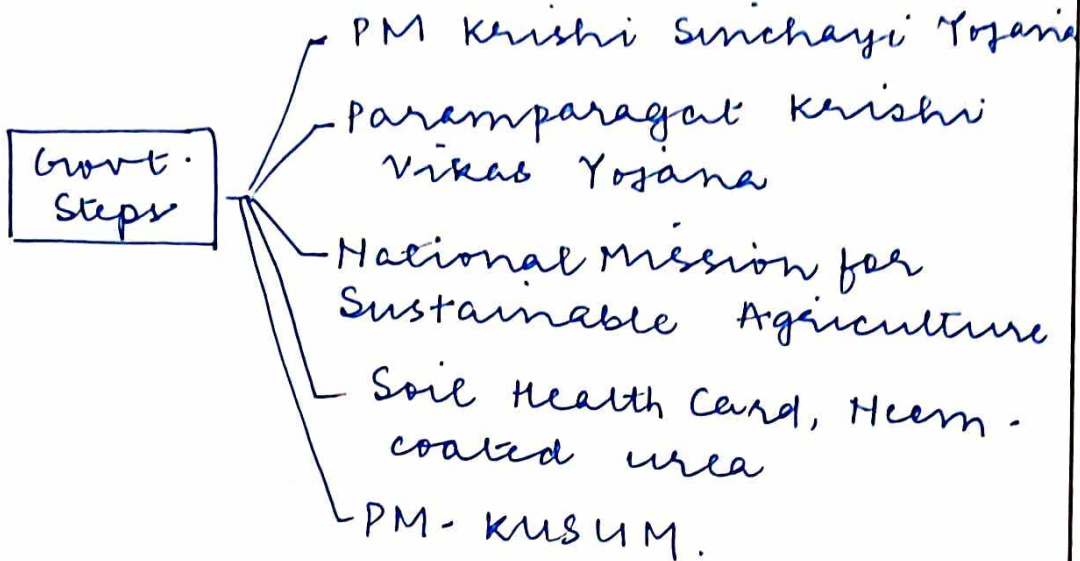
- More integrated value chain
- Accessible Marketplaces.

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This will ensure the viability of Indian agriculture and maintain Food Security as well.

5. Mega Food Parks were considered to be a gamechanger for the food processing sector in India, but their progress remains stunted. Discuss.

Food Processing Industry in India constitutes around 10% of our agricultural GDP. To further leverage its potential, Mega Food Park (MFP) initiative was launched.

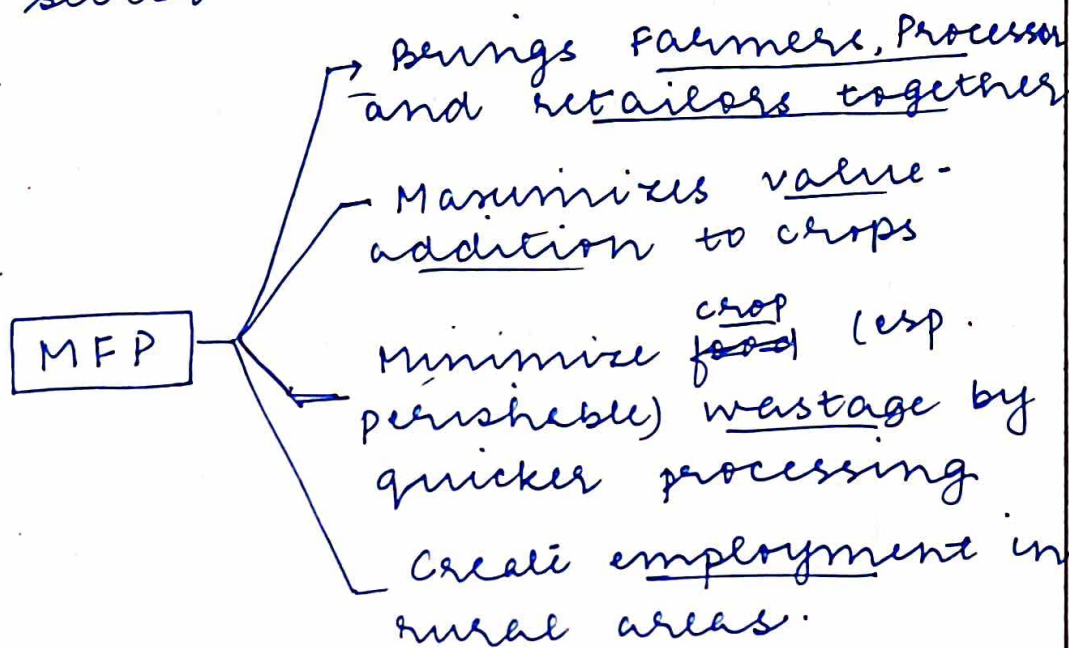
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MFP was considered to be a game-changer for food-processing sector. This was because -



However, the progress of MFP remains stunted. This is because →

## • Infrastructural Issues -

- Corruption & leakages in fund allotment
- Delays in project completion
- Cost over-runs.

## • Funding Issues -

- Difficulty to access loans due to newness of the concept
- Lacklustre private sector

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investment .

### 3) Regulatory Issues -

- very explicit and stringent regulations  
- This deters MNCs like Pepsico
- Lead investors are initially required to partner with 3-4 major players.  
- Corporates reluctant to do so.
- At least 2 investor is required to have a background in Food Processing and 50 acres land.  
- land acquisition issues.
- Delays in statutory clearances by state governments

# There is thus a need to develop a holistic strategy that takes into account localized problems, and offers unique solutions.

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6. Give an account of the challenges associated with rapidly increasing biomedical waste in India. Also, state the key features of Bio-Medical Waste Management (Amendment) Rules, 2018.

Biomedical waste comprises of human and anatomical waste as well as treatment apparatus used in healthcare facilities.

According to CPCB, India generates about 610 MT/day bio-medical waste, this is fast increasing due to the ongoing Covid-19 pandemic.

The **CHALLENGES** associated with this include -

- 1) Health risk to sanitation workers and garbage collectors due to -
  - a) lack of protective gear
- 2) Lack of waste segregation - affects the efficiency of incinerators.
- 3) Overburdened waste disposal capacity
- 4) Guidelines about disposal are not followed properly.
- 5) Lack of awareness among people

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In this context, Bio Medical Waste Management (Amendment) Rules 2018 are put in place:

## Key FEATURES

Pre-treatment of waste by disinfection, sterilization etc

Phasing out chlorinated plastic bags, gloves, etc.

Regular training and immunization of workers

Safe, ventilated location to store segregated waste within premises

Record maintenance & monitoring of activities

Establish GPS and bar-coding facility at common waste treatment facility.

Covid-19 has put a huge strain on an already fractured bio-medical waste disposal system in India. Thus, urgent steps are required to tackle this challenge.

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7.

What do you understand by impact based forecasting in disaster management? How can such forecasting strengthen disaster management preparedness?

Impact based forecasting is a technology developed by IMD. It is designed to forecast the expected impact as a result of expected weather conditions.

The Indian Meteorological department (IMD) has recently launched a dynamic impact-based warning system for cyclones.

Hazard and vulnerability are taken into consideration for this forecast approach.

Such forecasting can **STRENGTHEN** disaster management preparedness as well.

1) Better understanding of risk -

- a) Location - specific tailored warning
- b) Factors in local infrastructure, population density, etc.
- c) In-depth risk profile.

2) Proactive Planning - State can generate various impact scenarios based on different disaster effects.

3) Effective Response - 'Pre-event' scenario can help authorities to closely monitor impact of impending disasters & take real-time decisions.

4) Better coordination - All agencies can collect and use cartographic, geological and hydrological data better.

5) Encourages Community participation

Thus, India will be better prepared in dealing with disasters.

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8.

Lower Earth Orbit is becoming increasingly crowded as countries race to launch satellites into space. Highlighting the associated issues, discuss international efforts taken in this regard.

Lower Earth Orbit lies at a range of 200 to 2000 km around Earth. It contains the Hubble Space Telescope, International Space Station as well as many other satellites.

As countries race to launch satellites into space, there is an emerging risk of more congestion in the Lower Earth Orbit (LEO). The ISSUES associated

to this include-

- 1) High amount of space debris  
• This can strike and damage our assets in space.
- 2) Increased crowding as well as relatively higher speeds of satellites (in LEO) can lead to collision among satellites.
- 3) This ~~is~~ risk can also pose a safety risk to people and

property in space, and on Earth.

- It can affect the working of satellites, thus disrupting communication, navigation, etc.

Therefore, there have been certain INTERNATIONAL EFFORTS in this regard like -

- 1) Clear Space Mission - To be launched by European Space Agency in 2025 in the form of a robot, 'Chaser'.
- 2) Remove Debris Mission - A satellite project by University of Surrey to demonstrate various debris removal tech. like Net capture, Harpoon capture, etc.
- 3) Desorbit Mission - By ESA to capture and safely burn up ESA-own defunct satellites in LEO.

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4) Japan's Cargo Ship - It will use a 700 m long tether to remove space debris by slowing down its movement and eventually pulling it out.

5) MOTR (Multi Object Tracking Radar) - by ISRO and Physical Research Laboratory.

These steps are much-needed in the present scenario. This field requires more research and development in order to safely continue our space-related projects.

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9. Enumerating the existing measures to counter bio-terrorism in India, highlight the need for a bio-terrorism law.

Bi terrorism refers to the intentional release of biological agents or toxins for the purpose of harming or killing humans, animals or plants.

Few incidents in the past have raised the risk of bioweapons in India, such as the subbreak of scrub typhus during Indo-Pak war (1965) in Assam & West Bengal

To counter bio-terrorism in India, certain MEASURES that exist are-

1) A specialized force is set up under Ministry of Home Affairs to deal with chemical, biological, radiologic-al and nuclear attacks.

◦ This is called the NDRF (National Disaster Response Force)

2) India has also ratified the Biological and Toxin Weapons

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Convention (1972).

- It prohibits signatory countries to develop, stockpile or acquire microbial / biological agents.
- India pledged to abide by it in 2015.

3) Special Chemicals, Organisms, Materials, Equipment & Technology (SCOMET) Guidelines provides -  
◦ Stringent export product control list for dual use items.

At the same time, India lacks a comprehensive law to deal with bio-terrorism in India. There is a HEED for such law because -

- 1) India shares borders with countries like Pakistan & China, that have a history of hostilities (both overt and covert) with us.
- 2) With advancements in biotech, access to potential bioweapons for both state and Non-State Actors increases.
  - This makes India vulnerable.

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3) Recent outbreaks of Nipah virus, Covid-19 virus, etc. ~~with~~ had devastating impact.

- They are potential bioweapons.
- India's initial response exposed the gaps in our approach
- Thus, a holistic strategy is required.

Therefore, a comprehensive bio-terrorism law is the need of the hour in India.

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10. Discuss the potential of 'Integrated Law Enforcement Centres' and 'Smart Walls' on India's border areas to address the prevailing security challenges.

India has a total border length of 15,106.7 km. It is marred with several issues like cross-border insurgency, illegal goods smuggling, human trafficking, etc.

Among the various efforts being made to tackle these issues, we have -

A. Integrated Law Enforcement Centres

• Recommended by BPRD (Bureau of Police Research and Dev). to have ILEC on all Indian borders.

• work as Integrated Check Posts with the mandate to register, investigate & dispose of all types of cross-border crimes.

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Potential Significance

Optimum resource utilized as different agencies pool & mutually share resources

Synergy of Efforts - eg. HCB's expertise, IB/RAW's surveillance and BSF's manpower

Enhanced Efficiency - All aspects of crime dealt with at a single place → speedy disposal

No need of separate infrastructure for every unit

Structure & functions are 'Federal in Nature, Unitary in Spirit' - in accordance with our Constitution

## B. Smart Walls for borders -

- o A collection of discrete technologies that work together to prevent cross-border smuggling, illegal entry, etc.
- o Includes drones, scanners, sensors, etc
- o Recently deployed at USA - Mexico border.

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कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

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Potential Benefits

<sup>DEPLOYMENT</sup>  
Better than physical walls due to rugged, ill-defined border terrains

Sharper surveillance due to use of technology like sensors etc.

Although smart walls are not very feasible for longer borders, they can be very helpful to deploy in shorter critical stretches.

Thus, IEC and smart walls will be a great addition to India's security architecture.

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11.

Farm loan waivers are neither adequate nor recommended for promoting sustained agricultural growth. Analyze.

According to HSO reports, over 50% of agricultural households in India are in debt. To cope with this, Farm loan waivers (FLW) are often used. However, they are

neither adequate nor recommended because -

- It covers only about  $\frac{2}{3}$ <sup>rd</sup> of small and marginal farmers who have access to bank credit.
- As RBI stated, it undermines honest credit culture.
- According to Public Accounts Committee, it can lead to corruption, inclusion and exclusion errors, unused funds, etc.
- After every FLW, banks are more reluctant to give agricultural credit. This reduces access of farmers to credit.

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- Increases future HPAs & crowding out of private investments.
- Increases fiscal pressure on government & fiscal targets are breached.
- FLW can be politicized - linked to populism.  
FLW are no panacea for agricultural distress.

## Solutions

- Extend irrigation facilities to rain-fed areas
- Bring market reforms
- Focus on cold storage infrastructure to curb distress sale & losses
- Promote more effective input usage
- Better insurance coverage
- Growth of allied sector

Thus, as Swaminathan Commission suggested, farm loan waivers should only be used in extreme situations - More

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focus should be on structural & institutional reforms.

12. A number of initiatives in recent years have focused on the MSME sector. Why is there a need to focus on this sector? Also, identify the measures taken by government and further scope of action.

MSME [as introduced via the Micro, Small & Medium Enterprises Development (MSMED) Act 2006] are entities engaged in manufacture, processing or preservation of commodities subject to investment limits.

MSME play a significant role in the Indian economy. This can be seen as -

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## Significance

- Contributes ~45% of overall Indian exports
- 2<sup>nd</sup> largest employment generator after agriculture
- Promotes innovation
- Contributes 6-7% to Manufac-turing GDP
- Fosters inclusive growth as ~54% MSME in rural areas

At the same time, they face many PROBLEMS, like -

## Problems

- Non-availability of skilled labour at affordable cost
- High competition from cheaper imports
- Ineffective marketing strategy
- Inadequate infrastructure
- Technological backwarness
- Limited capacity (dwarf firms)
- Lesser access to formal credit ~~due~~ due to lack of collateral (no hard assets), lack of financial credibility, etc.

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So, despite crucial significance, MSME suffer from many issues. Thus, government initiatives are needed for MSMEs. This includes-

## Measures

Credit linked capital subsidy scheme for tech. upgradation

National Manufacturing Competitiveness Prog. to enhance global competitiveness

ASPIRE - Scheme for Promoting Rural Industry & Entrepreneurship

PM Employment Generation Prog - Credit linked subsidy

MSE-Cluster Development Prog to enhance capacity and productivity.

Various online portals

- Udyami Mitra (by SIDBI) to increase credit access
- Samadhan - Payment related grievance redressal
- Sambandh - Monitor public procurement from MSMEs.

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Further scope of Action includes.

Way Forward

Integrate MSME into Global Value Chains

Inculcate entrepreneurial spirit among youngsters

Tie up with FinTech firms for easier funding

Take steps to backle the impact of COVID-19

- Soft loans at Minimal interest rates
- Large economic package to boost demand as well as investments.

Thus, MSME forms the core of Indian economy. Its capacity needs to be augmented by making it globally competitive & more resilient to shocks.

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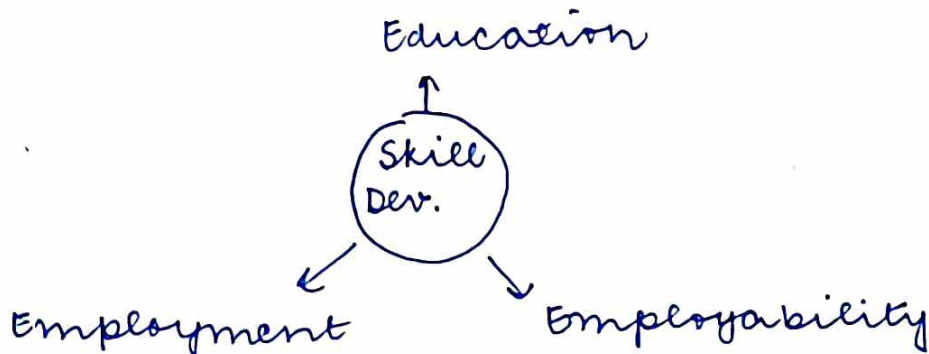
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13. Skilling the Indian population faces a 3E challenge - Education, Employment and Employability. Discuss. Also suggest intervention required to effectively manage the challenge.

250 W  
15 M

World Economic Forum's 'Future of Jobs' report has estimated that around 50% of Indian workforce needs reskilling by 2022. This highlights the crucial need of skill development in India.

However, skill development in India faces a 3E Challenge -



EDUCATION

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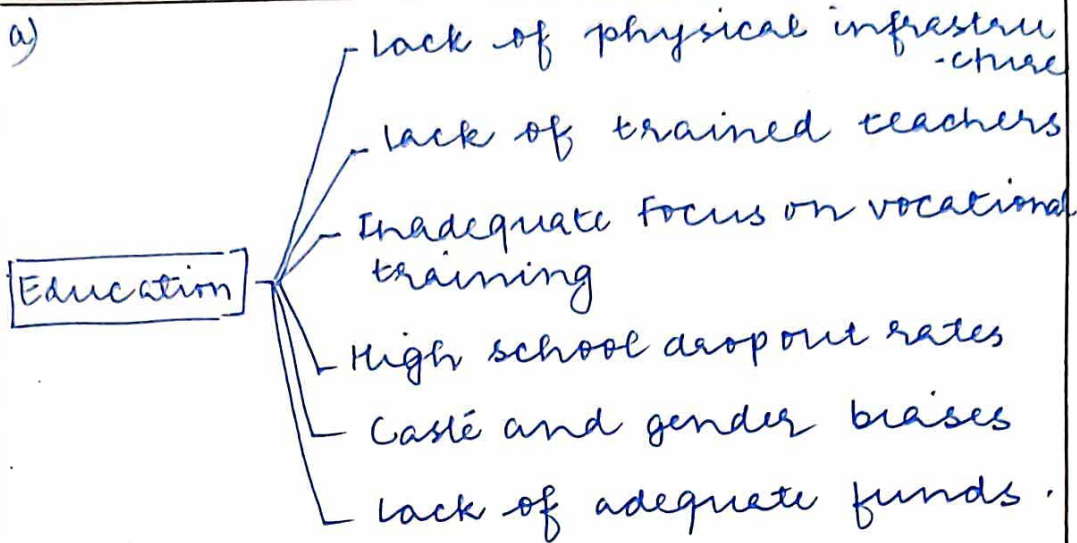
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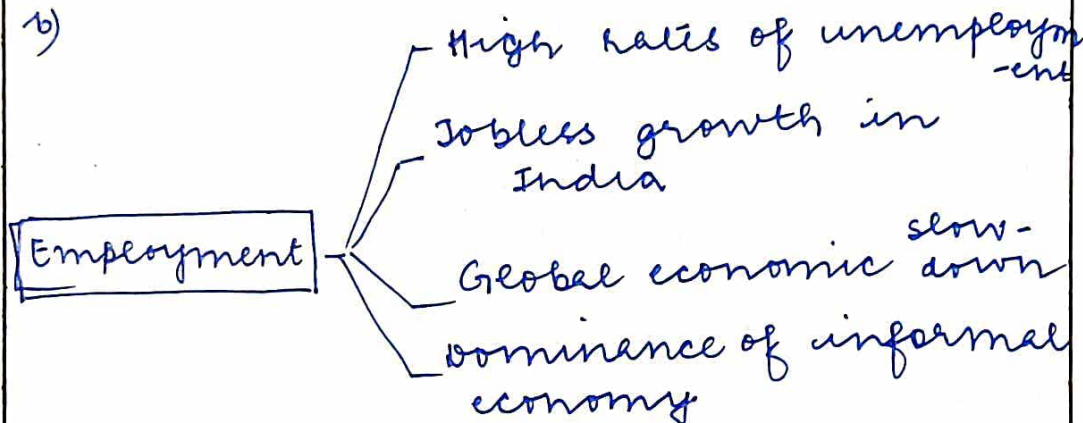
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इस कक्ष में  
कोई लिखना  
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margin

a)



b)



c)

## **Employability**

- NASSCOM estimates  $\rightarrow$  only 1 in 4 engineering graduates are employable
- low industry interface  $\Rightarrow$  mismatch ~~between~~ between demand & supply of skills
- no backward or forward linkages in training.  
eg. skill training in tourism involves aspects of 1 district alone - no broader coverage.

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To solve such issues, many steps have been taken by government such as -

Initiatives

Skill India - Train at least 300 million skilled people by 2022.

Skill Development Mission - to provide sound institutional framework

PM Kaushal Vikas Yojana  
Skillling 1 crore people by 2022.

Further INTERVENTION should include steps such as -

1) Implement Sharda Prasad Panel's Recommendations :-

- Create a robust National Vocational Education and Training system
- Apprenticeship training for all trainees
- Concepts like 'dignity of labour' & various career options to be part of secondary school curriculum
- At least 1 skill development centre in a cluster (10-12) of villages.  
- It should be linked to the local economy.

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- 2) create a well-defined monitoring and evaluation framework under NSDC
- 3) Increase private sectors participation.  
eg. NASSCOM - Future Skills Initiative
- 4) Link skill development with newer technologies
- 5) Focus also on socio-economic profiles.  
eg. Train manual scavengers to use machines for the same.

skill development thus requires urgent interventions. This will help India to achieve its goal of becoming a 5 trillion dollar economy.

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14.

Despite its importance, agricultural marketing faces various institutional and infrastructural issues in India. Elaborate. Also, enlist the measures that have been taken in this context.

Agriculture is still the mainstay of Indian economy, with around 50% of our workforce engaged in it. However, its GDP contribution is only about 14%. This highlights that agricultural sector is facing certain challenges.

An important aspect of agriculture is the marketing of produce. It faces various ISSUES, such as -

A) INSTITUTIONAL Issues →

1. Agricultural Mandis levy a multipitude of fees. This has a cascading effect on prices.

2. Farmers have to sell their produces only in Mandis. This reduces Freedom of choice.

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3) Positions in mandis are usually filled by people with political connections.

4) Corruption and diversion of grains illegally.

5) Issues in e-NAM :-

- digital illiteracy among farmers
- Corruption → grains are auctioned physically & fed into computer later

6) Cartelization by agents.

## B. INFRASTRUCTURAL Issues -

1) Swaminathan Commission had recommended at least 1 Mandi in a area of  $80 \text{ km}^2$ .

- In reality, there exists 1 mandis in area of  $450 \text{ km}^2$ .
- This hinders access of farmers

2) Lack of transportation for grains

- Farmers forced to sell at nearest Mandis at whatever price they get.

3) Inadequate warehousing/ storage facilities.

4) No sorting/ grading facility

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The MEASURES that have been taken in this regard are -

1) Agricultural Infrastructure Development Fund - For long term debt financing to create post-harvest management infrastructure

2) HITI Ayog's ~~Model APMC Act~~ Proposal to develop AGRISTACK - digital database & technology infra for better price discovery

3) Model APMC Act - to break monopoly of government mandis and give more choice to farmers.

WAY FORWARD

Focus on creating more storage facilities for produce

Better info. dissemination about prices to farmers

Need APMC reforms by taking care of the concerns of various stakeholders.

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Thus, agricultural markets need to be reformed to ensure the viability of agriculture as an economic activity in India

15. Marine litter is not just an environmental issue but poses a socio-economic challenge as well. Discuss. Also, enumerate the initiatives taken by the global community to reduce marine litter.

Marine litter refers to any persistent ~~na~~ human-made but discarded solid waste material present in seas and oceans. It is a major form of Marine pollution.

Eg. Around 8 million tons of plastic ends up in our oceans every year.

Marine litter poses a big **CHALLENGE** to -

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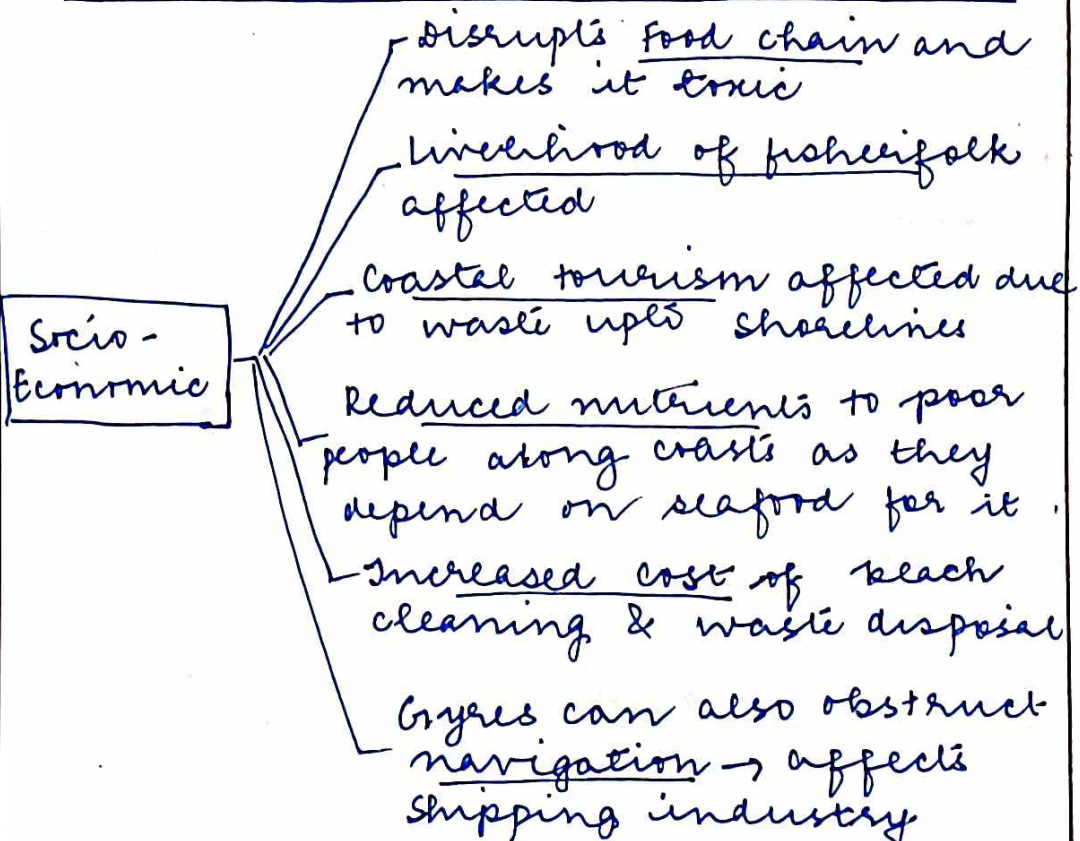
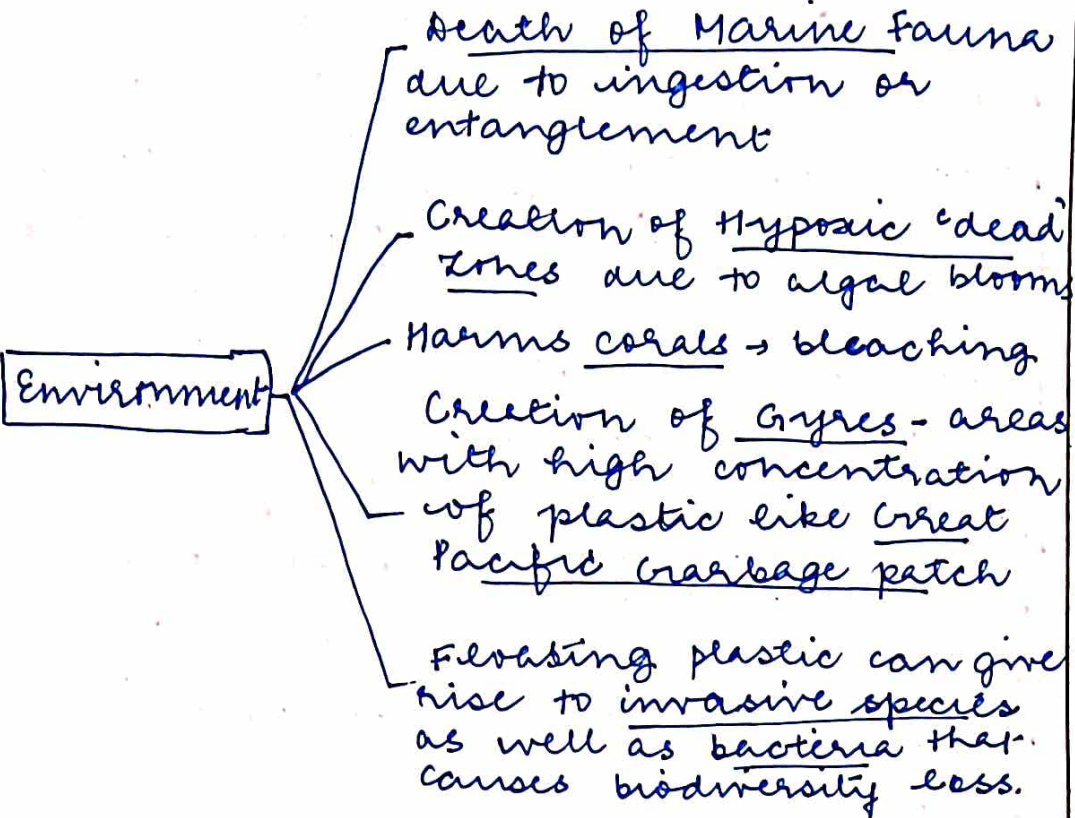
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Consequently, various INITIATIVES have been taken by the global community to deal with it -

1) London Convention - regulates dumping of waste from ships (only some non-harmful wastes are permitted)

2) MARPOL - Prohibits discharge of plastics (like fishing gear) into sea from ships.

3) Global Programme of Action for Protection of Marine Environment - To counter the issue of land-based pollution.

4) Global Partnership on Marine Litter -

- By UN Conference on Sustainable Development (Rio + 20)
- Mechanism for coordination
- Harnessing expertise & resources of all stakeholders.

Along with this, we need to shift the focus of general public towards harms of Marine litter. This will develop a global consciousness to restore marine ecosystems.

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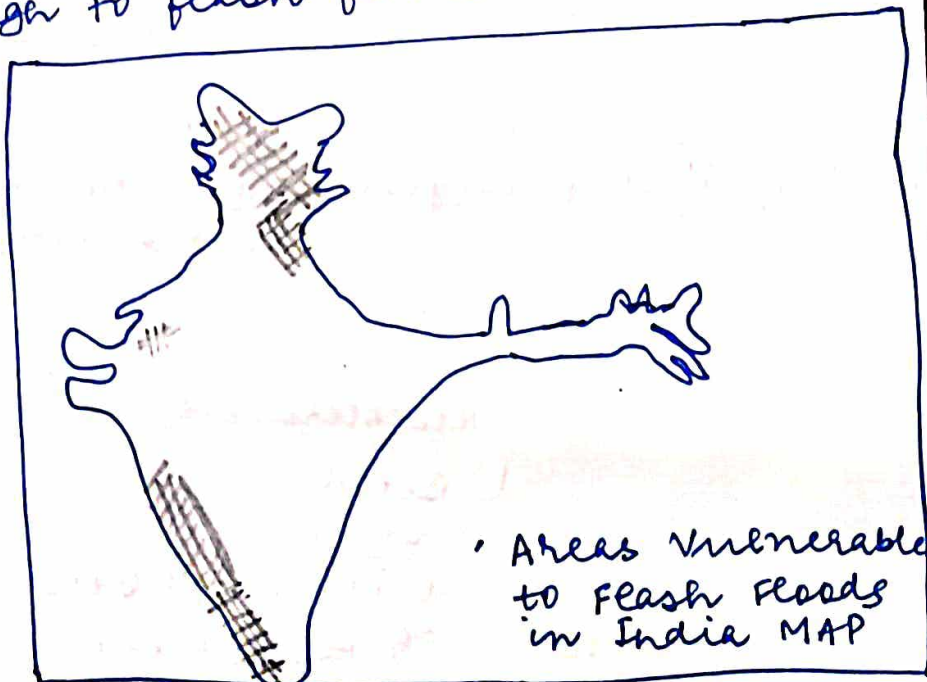
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16. Assess India's vulnerability to Flash floods and suggest measures for better resilience to flash floods. In this context, also briefly highlight the significance of recently launched Flash Flood Guidance system operated by the IMD.

Flash floods are highly localized events of short duration with a very high peak. They usually have less than 6 hours between the occurrence of rainfall and the peak flood.

Being naturally endowed with high mountains and vast rivers, India is VULNERABLE enough to flash floods.



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उम्मीदवारों को इस कालम में कहीं लिखना नहीं है।  
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## 1) NORTHERN HIMALAYAS

- Jammu & Kashmir, Uttarakhand, Himachal Pradesh
- Reasons - a) cloudbursts in hills  
b) breach of glacial lakes

## 2) WESTERN INDIA

- Luni basin (Rajasthan)
- Western Ghats slopes (Kerala, etc.)
- Reasons - Anthropogenic Activities like construction - reduce water-absorbing capacity of soil

## 3) URBAN CITIES

- High use of concrete
- Choked drainage systems

MEASURES for better resilience are-

### 1) Coherent Research

- Generation and collation of all data at 1 point.

### 2) Monitoring-

- Mapping Flood Zones
- Monitoring Glacial lakes.

### 3) Compliance Planning -

- checking indiscriminate construction
- Timely de-clogging of drains

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## 4) Global Best Practices -

o Tokyo and Kuala Lumpur - built extensive water discharge tunnels to hold diverted flood water

Further, India recently started the Flash Floods Guidance System designed by the Indian Meteorological department (IMD).

It provides real time warnings (6-12 hours in advance) at the watershed level for vulnerable South Asian countries like India, Nepal, Bhutan, Bangladesh and Sri Lanka.

### SIGNIFICANCE

better preparedness for disaster.

can save lives through timely evacuation

Proves way for seamless integration of technology in disaster management

Fosters international cooperation in dealing with disasters

Better streamlining of resources.

Thus, India and its neighbours will be able to deal with Flash Floods better.

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17.

Hydrogen-based energy production can play a key role in a clean, secure and affordable energy future. In this context, identify the potential and opportunities for utilizing hydrogen-based technology. What are the challenges that need to be addressed to fulfill the potential?

In the Budget 2021-22, India announced the launch of National Hydrogen Energy Mission (NHEM). This shows the cruciality of hydrogen based energy technology in India.

Hydrogen-based technology has a strong **POTENTIAL** in India, which includes -

- 1) Cleaner Fuel - Hydrogen is 100% clean and the only by-product is water.
- 2) Alternative Fuel - Ability to power fuel cells in zero-emission electric vehicles.
- 3) Efficiency - At least 2-3 times more efficient than an internal combustion engine running on

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gasoline.

4) Renewable Energy - Hydrogen is a renewable source of energy.

As such, it has immense

OPPORTUNITIES in India as -

1) Due to high air pollution, India is yearning for cleaner fuels.

2) Rapidly growing population - need of efficient energy has increased.

3) Vast automobile market - high growth in demand for electric vehicles.

4) Policy support

a) India's INDC to achieve net-zero emissions by 2070

b) Aim to meet 50% energy needs from renewable sources by 2030.

5) Increasing R & D in energy sector  
→ tech - support.

At the same time, there are many CHALLENGES as well.

This includes -

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5) Increasing R & D in energy sector  
→ tech - support.

At the same time, there are many CHALLENGES as well.

This includes -

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उम्मीदवारों को इस हार्शिए में नहीं लिखना चाहिए  
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2) Massive Tech. Expansion - For instance, electrolysis plants that split water into hydrogen and oxygen  
◦ High power will also be needed for the reaction

2) Additional Costs for generation, transmission and distribution

3) Storage - Hydrogen is hard to store as it needs to be compressed to 700 atmP and -253°C temperature.  
◦ It is also more explosive

4) Need for a Code of Commercial Standards for consistent deployment

5) Lack of supply infrastructure.

These challenges, when adequately addressed; could pave way for India to have a greener, more sustainable future.

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18. Despite the huge promise of satellite-based internet connectivity, it hasn't gained traction on a significant scale, especially in India. Discuss.

Satellite-based internet connectivity operates by sending and receiving broadband signals to a satellite in space, instead of using underground copper/fibre network. It can be achieved by using Geo Stationary, Medium and Lower Earth Orbit Satellites.

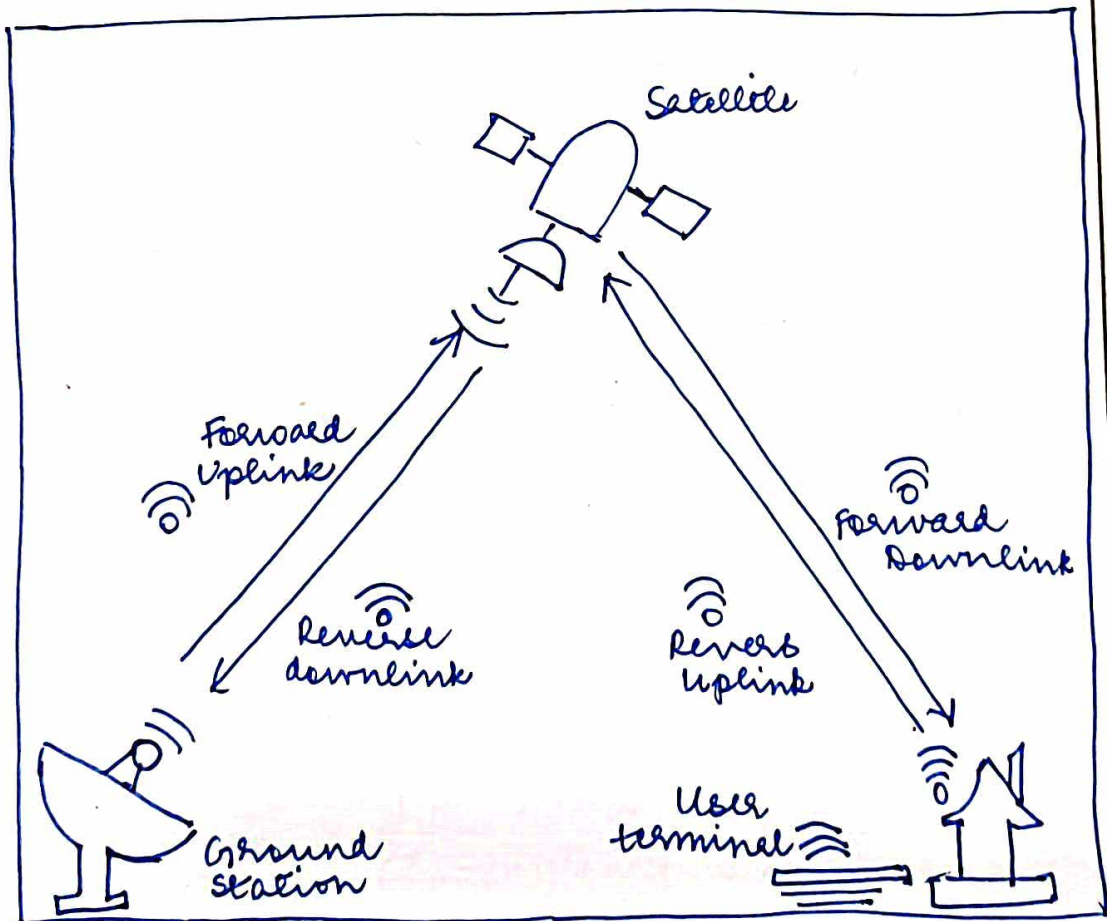


Fig. 1.

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Satellite based Internet promises many ADVANTAGES, such as -

- 1) Easier to deploy and wider coverage -
  - a) Faster rolling out and scaling up
  - b) More cost effective
  - c) Easier deployment even in remote areas

2) Stronger Bandwidth -

- a) Can handle higher bandwidth
- b) Internet speed/quality unaffected mostly, even at 'peak use times'.

3) Expansion of Internet -

- a) Can provide vital 'backhaul' or connectivity between mobile towers & telecom companies' core network.
- b) Ensures uninterrupted coverage.

However, it has not gained significant traction, especially in India; due to various CHALLENGES -

1) High costs to consumers -

- a) Around \$ 15 - \$ 20 per GB (Normal mobile data costs around \$ 0.68 per GB).

b) Indian situation is further complex due to the presence of intermediaries which has a cascading effect on prices.

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## 2) Lack of Sufficient Domestic Satellite Capacity -

- a) Inadequate access to satellites offering 100-500 Gbps throughout
- b) Telecom players can't lease bandwidth capacity directly from foreign operators.

## 3) Space Debris in LEO -

- a) Increased deployment of satellites.
- b) More chances of Kessler Syndrome (collisional cascading)

## 4) Operational Issues -

- a) Poor latency or 'high ping rates' as data is sent to space, to individual ISP and back again.
- b) Minor weather disturbances can affect signal & internet quality.

Thus, while this have high promises, it need significant pre-requisites as well. Space-X's 'Starlink Project' has already started LEO-based internet. ~~but~~ while there's a lot to learn here, we also need to proceed with caution.

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19.

India's attempts at strengthening its intelligence infrastructure and capabilities have historically been reactive and incremental, rather than holistic and sustainable. Discuss. Also, provide a concrete framework in transforming India's intelligence capabilities.

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India today has a sound intelligence architecture, integrating modern technology, departments like RAW and IB as well as complementary armed forces.

However, our intelligence infra and capabilities have historically been reactive and incremental. This can be seen as -

a) our chief foreign intelligence agency RAW was set up <sup>in 1968</sup> only after the debacle in India-China war

b) counter terror forces, CCTV network, etc. in major coastal cities (like Mumbai) was ~~was~~ set up after the 26-11 attacks.

Instead, due to complex borders, hostile neighbours etc. India needs to have a holistic

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and sustainable intelligence  
FRAME WORK, such as-

- 1) Better Coordination - Appoint a national intelligence coordinator for better coordination, remove overlaps - duplication, end turf - wars, etc.
  - 2) Legal Status - Give a statutory basis and charter to intelligence community as well as an institutional level of accountability.
  - 3) Improve Accountability -
    - Financial - Annual reports to CAG/HSA
    - Separate intelligence ombudsman
    - Parliamentary Committee for oversight
  - 4) Technology & Innovation - By creating a tripartite network of government, private sector and academia.
  - 5) Recruitment Reforms - Better training, transparent promotions, etc.
  - 6) Gathering information from open sources.
- All this will help in improving India's intelligence architecture.

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20. In light of the prominent instances of drone attacks by both state and non-state actors, assess the challenges and capabilities of India in dealing with such security threats.

Drones are now increasingly being used for combat purposes, particularly for attacks on opposite sides. Recently two drone dropped IED explosives on an Indian Air Force base in Jammu, by suspected non-state actors.

This highlights the need to deal with drone-induced security threats to India. There are certain

**CHALLENGES**, like -

1) Inadequate Surveillance - Technology including radar systems that India has deployed along border mostly track bigger objects like planes & missiles

2) Difficult to Track because drones are -

a) Smaller in size

b) Higher speeds

c) Fly at lower altitudes

d) Have miniscule radar.

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## 3) Issues in Neutralizing -

- a) currently, our only option is to shoot them down after jamming them, using eyesight to spot.
- b) But most are difficult to detect. So, operational precision is less.

## 4) Swarm Drones - Multiple drones swarm together to destroy stimulated targets.

- a) This confuses detection systems
- b) our counter-tech. hasn't been able to keep up.

At the same time, India has gradually acquired CAPABILITIES, in order to be a better position. This includes -

## 1) Antai - Drone System -

- Developed by DRDO
- Detect and destroy technology
- Yet to be mass-produced.

## 2) Foreign Collaborations -

- Sea Guardian Predator drones from USA
- Israel's Smash-2000 Plus computerized fire control and electro-optic sights.

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WAY  
FORWARD

Develop anti-drone defensive technologies like Drone Dome, Interceptor drones, etc.

Industry - defence - academia linkages

Focus on being a Major Exporter instead of import → boost up indigenous production

Human Resource development & capacity building

Integrated defence Modernization with focus on infrastructure.

This will greatly enhance India's security ecosystem.